

Enhanced Proliferation Resistance and Safeguards Technology for Nuclear Energy

Keynote Address

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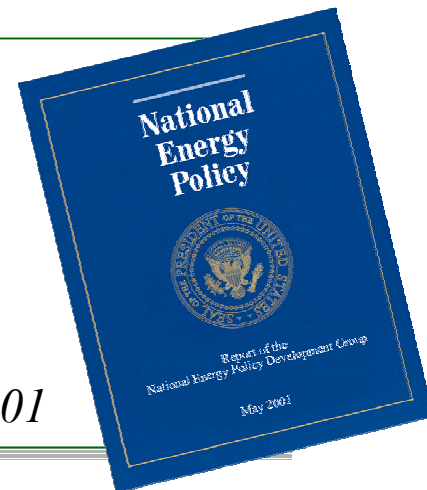
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The National Energy Policy and Nuclear Power

“The NEPD Group recommends that the President support the expansion of nuclear energy in the United States as a major component of our national energy policy.”

Report of the National Energy Policy Development Group, May 2001



Calvert Cliffs Nuclear Power Plant

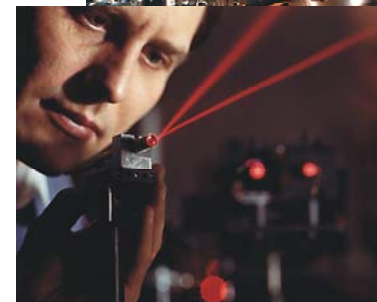
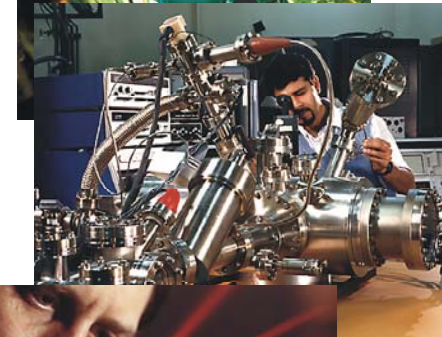
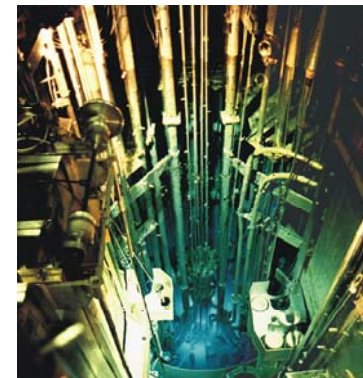
Recommendations:

- ◆ Support expansion of nuclear energy in the United States
- ◆ Develop advanced nuclear fuel cycles and next generation technologies
- ◆ Develop advanced reprocessing and fuel treatment technologies



Challenges for Expanding Nuclear Energy in the U.S.

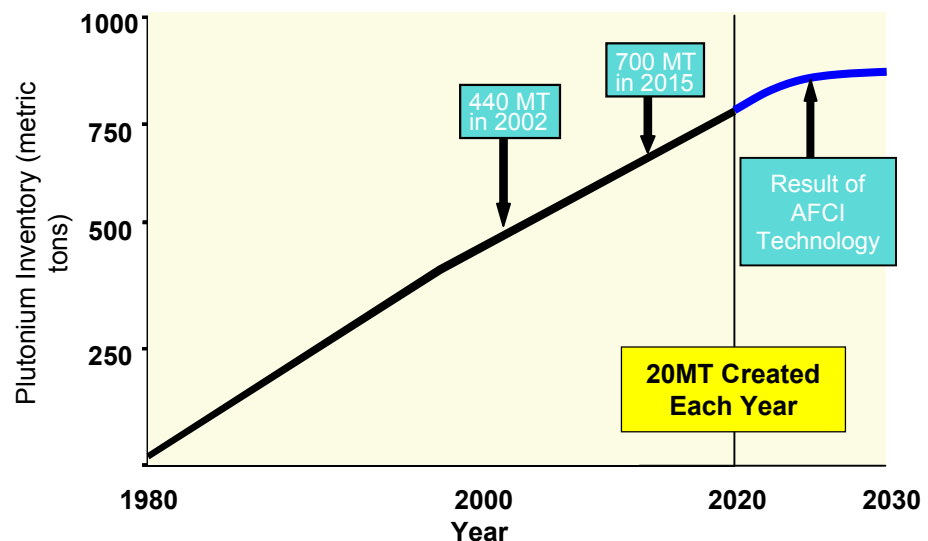
- ◆ Nuclear technologies present opportunities for a world economy characterized by zero net greenhouse gas emissions
- ◆ Concerns over the potential for increased availability of weapons - usable material is an obstacle to increased use of nuclear energy
- ◆ Through technology development, nuclear energy expansion can be safe, secure, economical, and environmentally beneficial



Development of Proliferation Resistant Technologies: *Advanced Fuel Cycle Initiative*

◆ AFCI objectives:

- Reduce the volume of high-level nuclear waste
- Reduce the cost and optimize the performance of Yucca Mountain repository
- Reduce the toxicity of high-level nuclear waste
- Provide long-term fuel source for U.S. nuclear power
- Reduce inventories of civilian plutonium



Development of Proliferation Resistant Technologies: *Advanced Fuel Cycle Initiative*

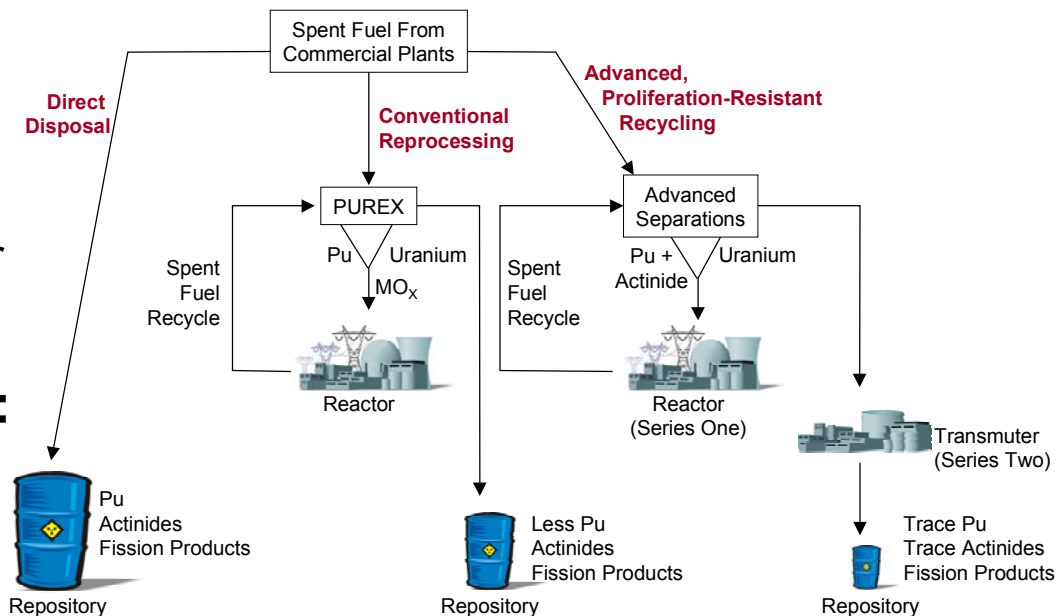
◆ AFCI will develop:

- Treatment technologies that eliminate the separation of pure plutonium
- Advanced nuclear fuels that contain plutonium and minor actinides

◆ Accomplishments to date:

- Demonstrated uranium separation at 99.999 percent purity
- Demonstrated fabrication of proliferation resistant nitride and metal fuels

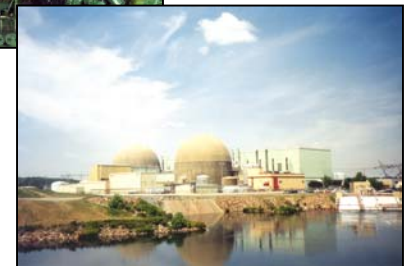
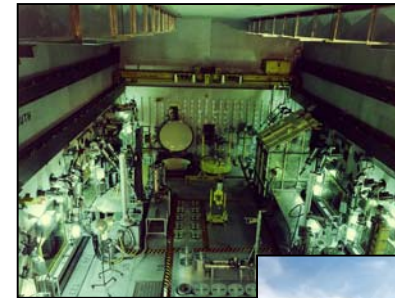
Approaches to Spent Fuel Management



Development of Proliferation Resistant Technologies: *Advanced Fuel Cycle Initiative*

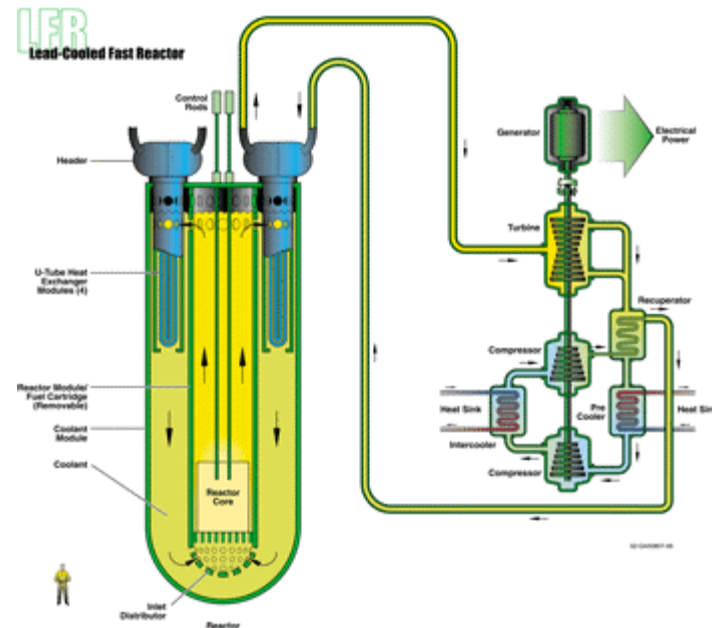
Joint NE and NNSA efforts in Advanced Fuel Cycle Initiative

- ◆ **Developing instrumentation and management controls to monitor flow of materials in fuel recycle facilities**
- ◆ **Established Blue Ribbon Panel for the evaluation of proliferation resistant fuel cycles**
 - Balancing intrinsic and extrinsic proliferation resistance requirements



Development of Proliferation Resistant Technologies: *Generation IV Nuclear Energy Systems*

- ◆ **Gen IV will develop advanced reactor and fuel cycle systems**
- ◆ **System designs guided by technology goals in four goal areas:**
 - Sustainability
 - Economics
 - Safety and reliability
 - Proliferation resistance and physical protection



Development of Proliferation Resistant Technologies: *Generation IV Nuclear Energy Systems*

◆ Joint NE and NNSA Program on Proliferation Resistance and Physical Protection of Generation IV Concepts

- Formed Expert Group which includes representatives from national laboratories, academia, Generation IV International Forum
- Develop methodology for the assessment of Generation IV systems
- Develop proliferation resistance and physical protection metrics
- Issue first draft of methodology in December 2003



U.S.A.



United Kingdom



Switzerland



South Korea



South Africa



Japan



France



Canada



Brazil



Argentina



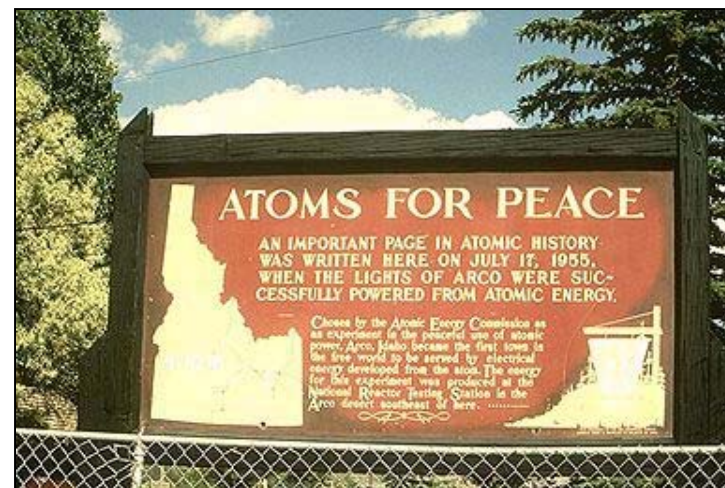
New Technology Can Lead to New Policy

◆ Linking policy and technology

- Past policies were made based on past technology
- Development of new technology can lead to significant policy shifts

◆ Examples of new technology

- Sealed reactor cores
 - Operates for decades
 - Can be returned intact to a safe and secure internationally-controlled area
- Stand-off laser analytical methods
 - Capable of measuring a wide range of elements and isotopes



Proposed Challenges for this Workshop

- ◆ **Consider opportunities for further enhancing the “handshaking” between intrinsic and extrinsic proliferation safeguards**
- ◆ **Suggest future enhancements to the international nonproliferation regime that parallel DOE’s ambitious next-generation nuclear technology agenda**



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